

AH-1Z: Weapons Upgrade or Downgrade?

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AH-1Z: Weapons Upgrade or Downgrade?

BELL Helicopter advertises the weapons capability of the new and improved AH-1Z as "the most capable and flexible multi-mission attack helicopter in the world."¹ One of the main differences of the AH-1Z from its predecessor, the AH-1W, is the removal of the TOW missile system. If the AH-1Z does not retain the ability to employ the TOW missile system, or a like counterpart, how is it a more capable platform? The TOW missile system provides weight, trajectory, weather and ease-of-use advantages that make it a desirable weapon. The TOW missile coupled with the HELLFIRE missile system also provide more flexibility for attack helicopters and their supported ground units in the operating environment. The AH-1Z Attack Helicopter should have a TOW missile capability as evidenced by the TOW's uses and advantages compared to the HELLFIRE missile and the role attack helicopters are playing in today's Marine Corps.

The AH-1 'Zulu' SuperCobra is part of an upgrade program funded by the United States Marine Corps to replace the aging capabilities of the currently used attack

¹ Bell Helicopter, *The AH-1Z Fight or flight? No need to ask.*
<<http://www.bellhelicopter.textron.com/en/aircraft/military/bellAH-1Z.cfm>>

helicopter, the AH-1W. Tests and evaluations prove the Zulu model's improved capabilities, including a new rotor system, improved avionics and communications systems, an advanced targeting system, and a redesigned, modernized cockpit.² The new weapon capabilities allow the Zulu to carry sixteen precision-guided missiles (PGMs) instead of the previous limit of eight on the AH-1W. This increased weapon capacity does have advantages, but a concern is in the type of PGMs that the new attack helicopter will carry. The current model carries TOW missiles, or HELLFIRE missiles, or some combination of the two. Of the sixteen PGMs that the Zulu will carry, the only choice is the HELLFIRE missile. The AH-1Z could be retrofitted to carry the TOW missile, but because the Marine Corps decided to stop purchasing the aging missile in the early nineties in order to phase out the system, the new attack helicopter was not designed with that capability.

The tube-launched, optically-tracked, wire-guided (TOW) missile was first introduced into service in 1970 by the United States Army. It was designed as one of the first precision-guided, anti-tank missiles in the world. The TOW missile quickly gained recognition and has been

² Bell Helicopter, *The AH-1Z Fight or flight? No need to ask.*
<<http://www.bellhelicopter.textron.com/en/aircraft/military/bellAH-1Z.cfm>>

distributed for use to over 36 countries worldwide.³ The basic concept of the TOW missile has stayed the same since its inception. When used with attack helicopters, the TOW missile provides a standoff, direct-fire missile that incorporates a shape-charge warhead capable of defeating nearly every armor threat in the world today⁴. Other uses for the TOW include employment against bunkers, light-armored vehicles, buildings and fortified positions. The TOW missile can currently engage targets as close as 500 meters and out to a distance of 3,750+ meters from the delivery platform.

The AH-1Z uses the HELLFIRE system for a precision guided missile capability, but without TOW employment means the cobra cannot mitigate the disadvantages of the HELLFIRE system. The primary HELLFIRE disadvantages that the TOW system augments are laser effects, flight trajectory, and weight considerations.

The HELLFIRE missile is a helicopter-launched, fire-and-forget missile. All of these missiles being used today in the Marine Corps are laser guided. They contain a seeker on the forward end of the missile that receives reflected laser energy for guidance to its target. Not

³ FAS Military Analysis Network, *M-220 Tube-launched, Optically tracked, Wire-guided missile (TOW)*, <<http://www.fas.org/man/dod-101/sys/land/tow.htm>>

⁴ NWP 3-22.5-AH1 NAVAIR 01-110HC-1T Volume I (Rev. A), *AH-1 Tactical Manual*, pg 4-41.

only must the missile acquire the laser energy (or laser spot) before or during flight, the missile must continuously receive the reflected energy all the way to impact. Some models of the HELLFIRE missile do not possess the ability to regain the reflected laser energy if laser designation is lost during flight⁵.

Several factors can cause a HELLFIRE missile to either lose the laser spot or acquire the wrong reflected energy. These factors associated with lasing a target include attenuation, beam divergence, spot jitter, overspill, underspill, and entrapment. "Even a small number of *overspilled* or *underspilled* laser pulses can cause the missile to follow false signals. If this occurs just before missile impact, the (probability of a hit) is seriously degraded."⁶ Any one of these factors can cause an unsuccessful target engagement using the HELLFIRE missile. By contrast, the TOW missile is wire-guided during missile flight, making possible negative laser effects associated with HELLFIRE usage inconsequential.

Flight trajectory creates another reason for concern for employment of the HELLFIRE. Prior to missile launch, an in-flight missile trajectory is programmable by the

⁵ NWP 3-22.5-AH1 NAVAIR 01-110HC-1T Volume I (Rev. A), *AH-1 Tactical Manual*, pg 4-47.

⁶ Naval Tactics, Techniques, and Procedures 3-22.3-AH1W, *Tactical Employment AH-1W(U)*, pg 2-123.

pilot. Programmable trajectory gives the missile the ability to clear large obstacles between the delivery platform and the target. In all trajectory modes, the HELLFIRE missile increases altitude after its initial launch. This increase in altitude becomes a concern when considering low cloud ceilings in the employment environment. The TOW missile has a direct-fire trajectory that deviates from the direct line-of-sight of the shooting aircraft to the target by an insignificant amount during missile flight stabilization.

Describing atmospheric effects on aircraft performance, the AH-1W NATOPS Flight Manual states:

Increases in ambient air temperature, humidity, and/or pressure altitude restrict lift capability of the helicopter because a decrease in air density will result in decreased power available from the engine and a loss of rotor efficiency.⁷

The effects of high temperatures and altitudes limit possible payloads for rotary-wing aircraft, which make weight, a concern. A single HELLFIRE missile weighs approximately 100 pounds, and the HELLFIRE missile launcher weighs 141 pounds. A single TOW missile weighs approximately sixty pounds, almost half that of a single

⁷ NAVAIR 01-H1AAC-1, *NATOPS FLIGHT MANUAL Navy Model AH-1W Helicopter*, pg 6-1.

HELLFIRE.⁸ In rotary-wing aviation, the lightweight characteristics of the TOW missile provide flexibility with other aircraft weapon systems and loads.

Many AH-1 pilots today say the TOW is easier to use than the HELLFIRE because the TOW missile system requires less cockpit manipulation and time to shoot. With any weapon system, safety measures are implemented in order to prevent inadvertent discharges of that weapon. The HELLFIRE system has more safety constraints that must be met by the pilot before the missile will fire such as laser codes set and coded to each missile, laser constraints met if self-designating, and laser energy received by the missile in some launch modes. These constraints can cause delays in an already stressful and chaotic battlefield. The TOW has fewer safety constraints and, for most pilots, is the easier of the two missiles to employ.

The TOW missile has its disadvantages including a higher dud rate than the HELLFIRE and concern for wire rap and wire interference. But the ability to counter the disadvantages of the HELLFIRE missile system shows the necessity of the redundant missile systems.

The AH-1W has proven in its recent involvement in Operation Enduring Freedom in Afghanistan, Operation Iraqi

⁸ NWP 3-22.5-AH1 NAVAIR 01-110HC-1T Volume I (Rev. A), *AH-1 Tactical Manual*, pg 4-43.

Freedom, and sustainment and stabilization operations in Iraq that the platform is required in today's Marine Corps. Within these operations, the light-attack helicopter community has demonstrated the legitimacy of the TOW missile system as an organic asset of the attack helicopter. The AH-1Z promises to be the attack aircraft of the future, and will be well suited for Marine Corps Aviation. The Zulu has the ability to adapt the TOW missile system or an equivalent, but this requires a change in Marine Corps procurement. The TOW missile system is an older system and can use modifications and improvements, but this system is far from obsolete. Already possessing the technology and the backbone of this system requires only the restart of production and research of possible improvements. This is an easy change for the Marine Corps and a relatively inexpensive one. The TOW missile system is a necessary weapon capability for the H-1 program to keep the upgrade from actually being a capability downgrade.

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